Dilution Ventilation for a Solvent or Gas Release

Air flow to dilute an evaporating solvent or released gas to a target concentration, from the release rate, molar mass, mixing factor and conditions.

Method: Dilution ventilation Q = K G / C (ACGIH Industrial Ventilation manual); vapour volume from the ideal gas law

Input parameters

Unit system: SI

Parameter	Value	Unit
Release (evaporation) rate	0.50000	kg/h
Molar mass of the substance	92.140	kg/kmol
Target concentration (ppm by volume) Your exposure limit or a share of the lower explosive limit.	50.000	
Mixing (safety) factor	3.0000	
Air temperature	25.000	°C
Barometric pressure (absolute)	101.33	kPa

Calculated results

Parameter	Value	Unit
Vapour released	2.2127	L/min
Dilution air needed	7,965.7	m³/h

Notes for this case

- Dilution suits low-toxicity vapours released slowly and spread out; use local exhaust for toxic or concentrated sources.

Formula and method

$$\dot{V}_g = \frac{\dot{m}}{M} \cdot \frac{RT}{p}, \quad \dot{V} = \frac{K\dot{V}_g}{C \times 10^{-6}}$$

Variables

$\dot{m}$	Release (evaporation) rate	kg/s
M	Molar mass of the substance	kg/kmol
C	Target concentration (ppm by volume)	-
K	Mixing (safety) factor	-
T	Air temperature	K
p	Barometric pressure (absolute)	Pa
$\dot{V}_g$	Vapour released	m³/s
$\dot{V}$	Dilution air needed	m³/s

Method and standards

Mass balance.

Assumptions and limits

- Steady state; perfect mixing allowed for by K.
- The supply air is taken as free of the substance; a background concentration C_s would raise the flow to K V̇_g/((C − C_s) × 10⁻⁶).

References

- Dilution ventilation Q = K G / C (ACGIH Industrial Ventilation manual)
- vapour volume from the ideal gas law

Report details

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Release checks	2 reference cases of this calculator, computed independently, are checked on every release

Results are for engineering estimation. Verify critical designs against the referenced standards and your own data.

This calculator online

https://calc.firecad.com/hvac/loads/dilution-ventilation

Open this case on calc.firecad.com →

Reopens the calculator with the inputs of this report.